Syncope

Current Approaches to Diagnosis and Management

Syncope

- Common & important medical problem
- 1% of all hospital admissions
- 3% of all ER visits

Lipsitz LA. Queensland J Med. 1985;55(216):45-54.

Savage DD. Stroke. 1985;16(4):626-629.

Syncope in Elderly Population

- Incidence 6%
- Recurrence 30%

Savage DD. Stroke. 1985;16(4):626-629.

Causes of Syncope

- Cardiac
  - Arrhythmic
  - Nonarrhythmic
- Non-cardiac

Arrhythmic Causes of Syncope

- Sick sinus syndrome
- Sinus bradycardia or asystole
- Complete AV block
- Mobitz II AV block
- Hypotensive ventricular tachycardia
- Ventricular fibrillation
- Hypotensive supraventricular tachycardia

Nonarrhythmic Cardiac Causes of Syncope

- Aortic stenosis
- Pulmonary hypertension
- Acute myocardial infarction
- Pulmonary embolus
- Dissecting aortic aneurysm
- Carotid sinus hypersensitivity
- Neurally-mediated syncope

Noncardiac Causes of Syncope

- Transient ischemic attack
- Seizure disorder
- Subclavian steal
- Orthostatic hypotension
- Vasovagal syncope
- Conversion reaction
- Situational syncope (cough, micturition, defecation)
- Drug-induced
- Anemia
- Hypoglycemia

Common Causes of Syncope

- In young
  - Vasovagal syncope
  - Neurally-mediated syncope
- In elderly
  - Sick sinus syndrome
  - AV block
  - Ventricular tachycardia
  - Drugs

Drugs Causing Syncope

- Hypotensive agents
  - Nitrates
  - Antihypertensive agents
    - Beta blockers
    - Calcium channel blockers
    - ACE inhibitors
- Beta blockers
- Antiarrhythmics
- Psychotherapeutic drugs
- Hypoglycemic agents
- Illicit drugs/alcohol

Mechanism of Syncope from Antiarrhythmic Agents

- Proarrhythmia
- Suppression of sinus node function
- Exacerbation of conduction disease

Diagnostic Tests in Work-up of Syncope

- History & physical
- ECG
- Holter
- Echo/doppler
- EP study
- Tilt table testing
- Event recorder
- Insertable loop recorder
- Neurologic evaluation
- Psychologic evaluation

Of all tests for syncope, a thorough history & physical exam has the highest diagnostic yield.

History for Syncope Should Include:

- Medication use (prescribed and over-the-counter)
- Assessment for hyperventilation or multiple somatic complaints, which might suggest psychiatric syncope
- Assessment for possible cardiac or neurologic disease
- Distinction between mechanical fall, vertigo, orthostatic hypotension and true syncope

Physical Exam for Syncope Should Include:

- Orthostatic vital signs
- Examination for carotid disease
- Carotid sinus massage

Seizure Activities Common in Syncope

- **May not be neurological in origin**
- **May be 2° to low CNS blood flow from hypotension**

Value of ECG in Evaluating Syncope

Identifies:

- **Abnormalities suggestive of previous MI or underlying ischemia**
- **Rhythm abnormalities including AV block**
- **Bundle branch block**
- **Prolonged QT interval**

Value of Holter in Syncope Work-up

- Gibson, et al., retrospectively analyzed 7,364 patients undergoing 24-hour Holter during 5-year period.
  - Of these, 21% had been referred because of syncope.

Gibson TC. Am J Cardiol. 1984;53:1013-1017.

Findings of Retrospective Holter Analysis in Syncope

Yield:

- **Arrhythmia-related symptoms2% (syncope/near syncope)**
- **Syncope symptoms 15% (no arrhythmia)**

Gibson TC. Am J Cardiol. 1984;53:1013-1017.

Value of Holter in Syncope

Incremental yield with increased duration of Holter monitoring to 48 hours but no additional yield after 72 hours

Kapoor WN. Am J Med. 1987;82:20-28.

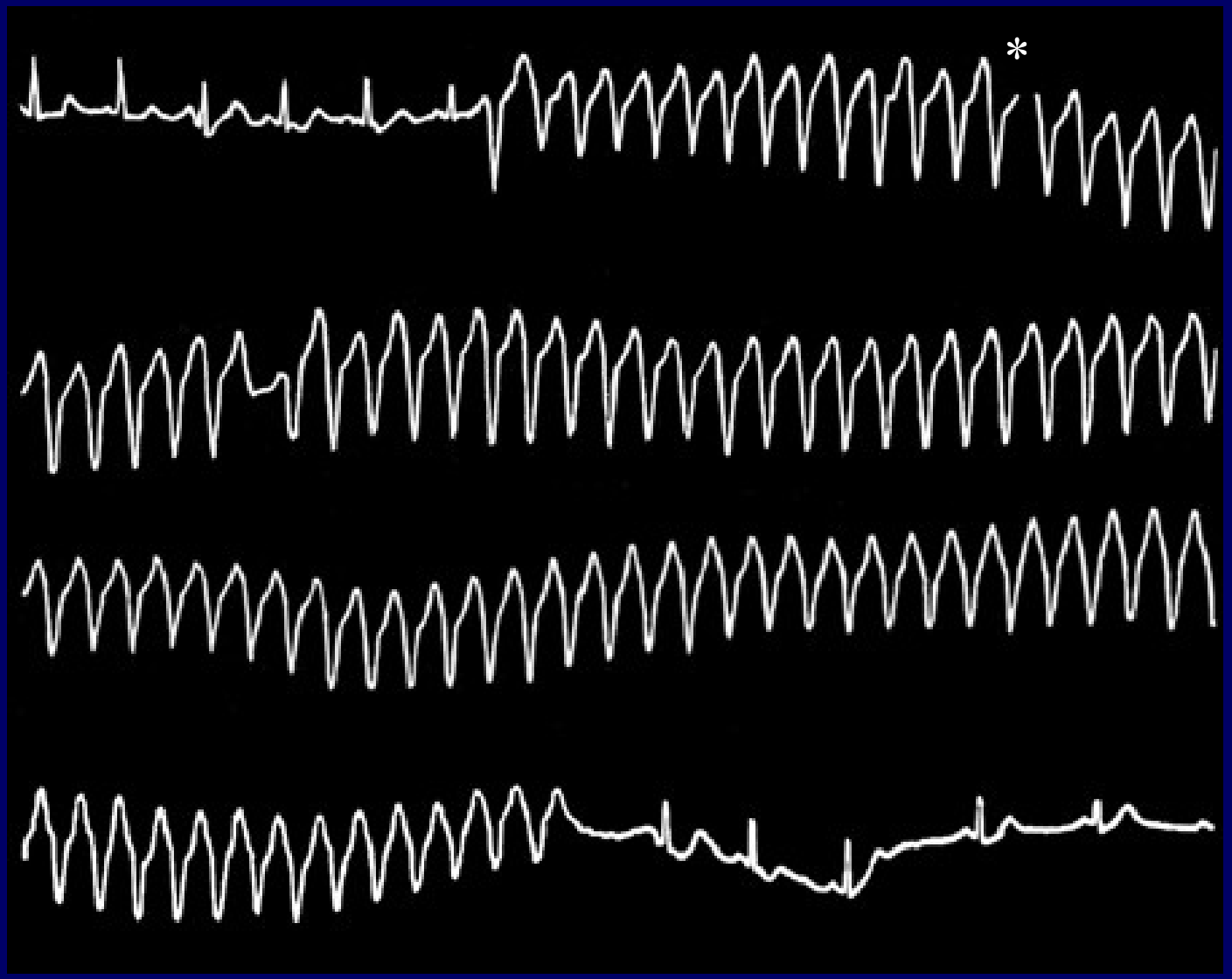
Value of Signal-Averaged ECG in Syncope

In a prospective study of patients referred to EP study for unexplained syncope, among patients with...

- **Inducible VT, 89% had late potentials**
- **Noninducible VT, 0% had late potentials**

Gang ES. Am J Cardiol. 1986;58:1014-1020.

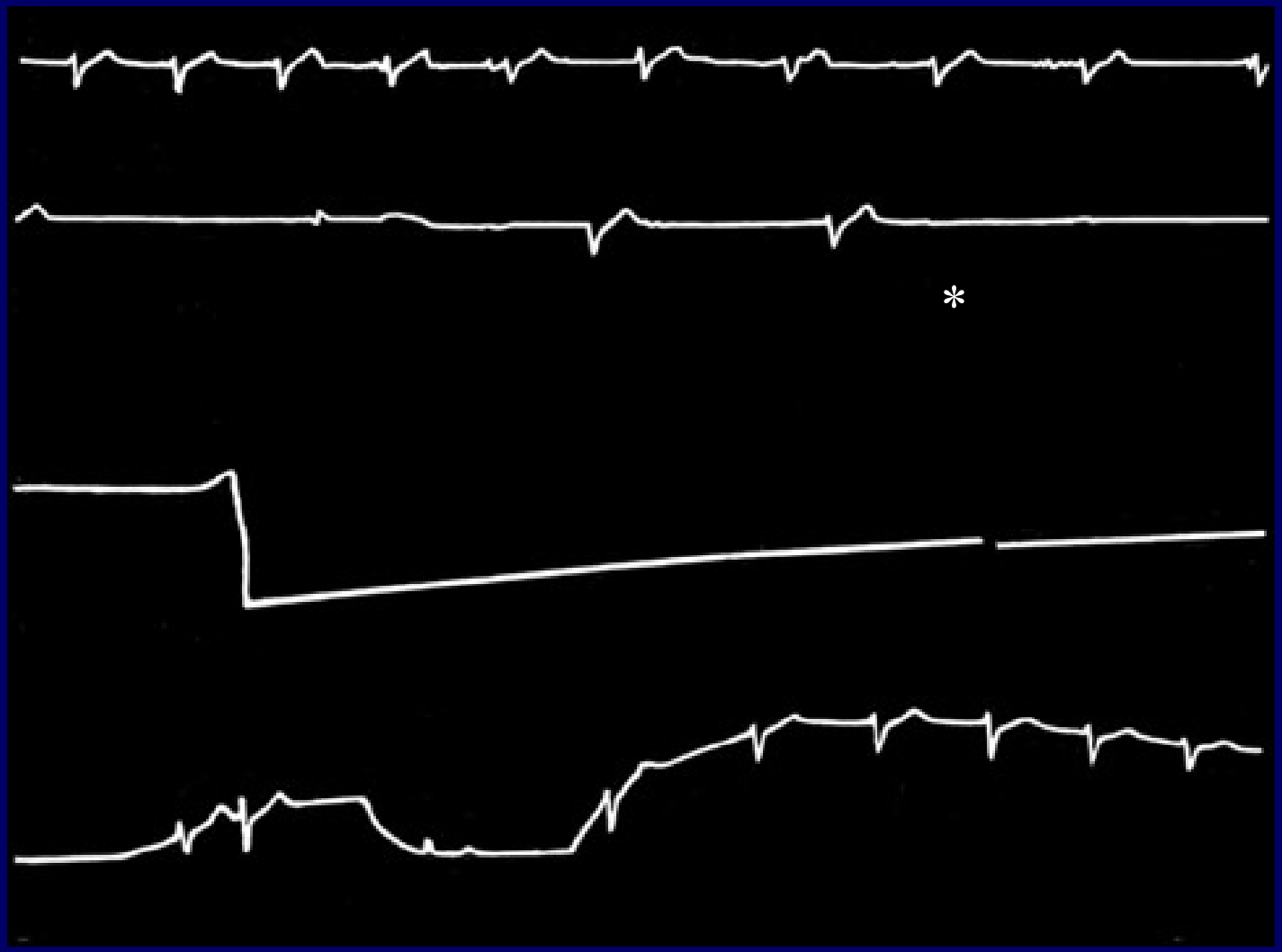
Value of Event Recorder in Syncope



*Asterisk denotes event marker

Linzer M. Am J Cardiol. 1990;66:214-219.

Value of Event Recorder in Syncope



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Value of EP Study in Syncope

Diagnostically helpful findings at EP study:

- **Markedly prolonged sinus node recovery time**
- **Markedly prolonged HV interval**
- **Infra-Hisian block**
- **Inducible VT**
- **Inducible SVT with associated hypotension**

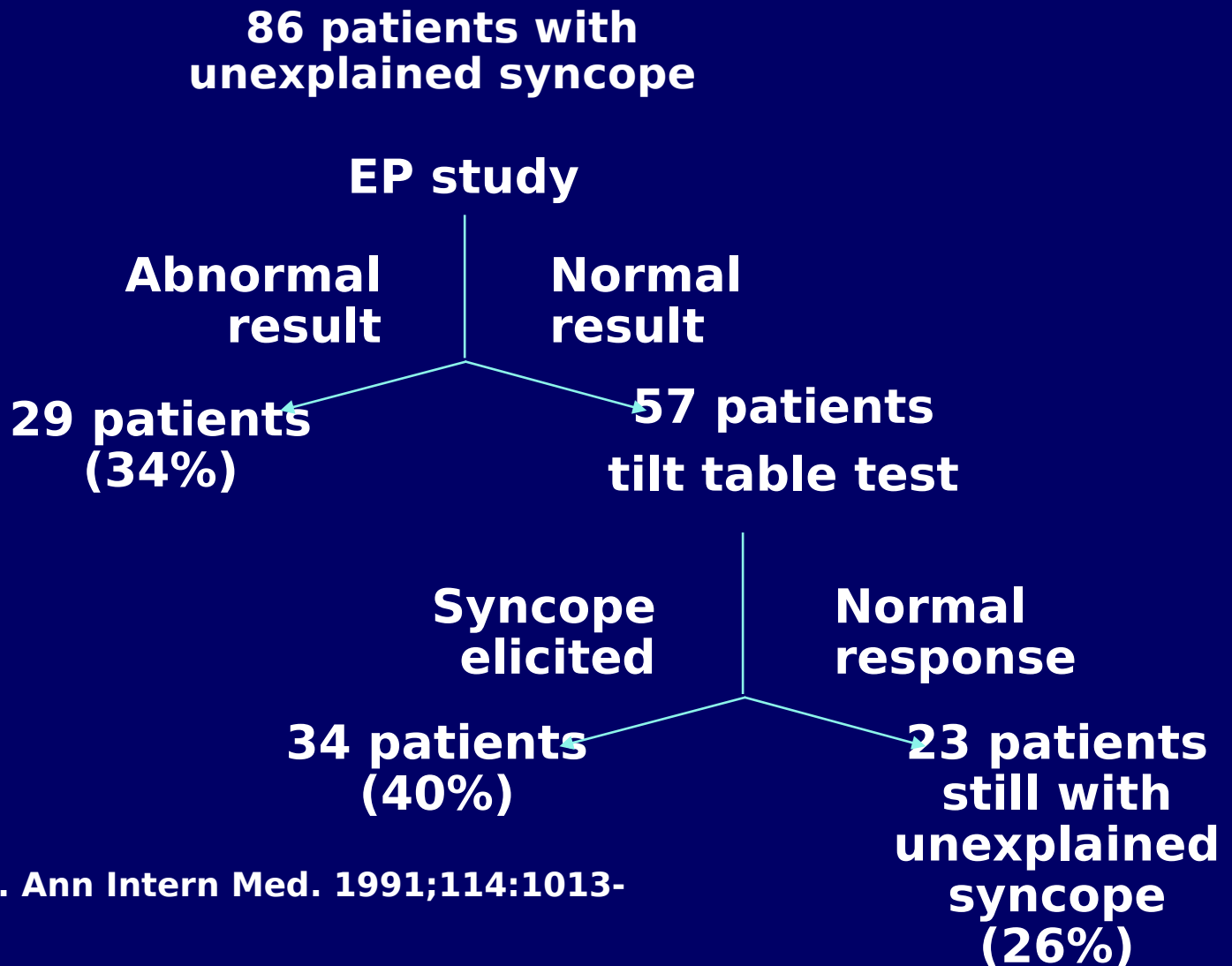
Diagnostic Yield (%) of Individual Tests in Work-up of Syncope

Author (N)	% With Clinical Setting	Recurrent Syncope	Neuro-H&P	ECG	Holter	CSM	EPS	logic	Other	Total
Eagle (100)	Inpatient	33	52	—	3	—	0	2	4	61
Day (198)	ER	37	73	2	2	—	—	9	—	87
Silverstein (108)	MICU	—	39	—	7.5	—	—	—	6.5	53
Kapoor (204) (1983)	In- and outpatient	68	25	6	14	—	1.5	0.5	5	52
Martin (170)*	ER	—	53	1	3	—	—	5	—	62
Kapoor (433) (1990)*	All	49	32	7	13	1	2	1	3	41

*Prospective study

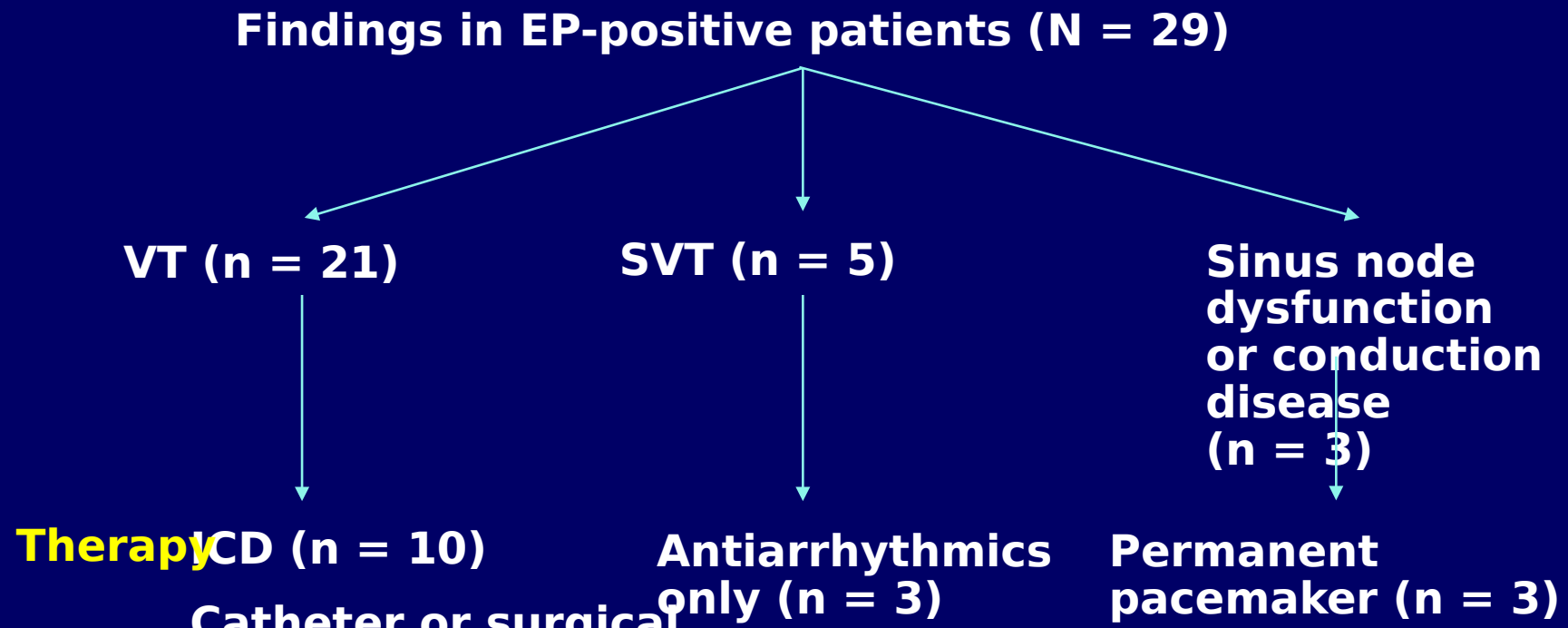
Chang-Sing P. Cardiol Clinics. 1991;9(4):641-651.

Diagnostic Yield in Unexplained Syncope: A Tertiary Center Experience



Sra JS. Ann Intern Med. 1991;114:1013-1019.

Findings and Treatment of Syncope Patients with Abnormal EP Study



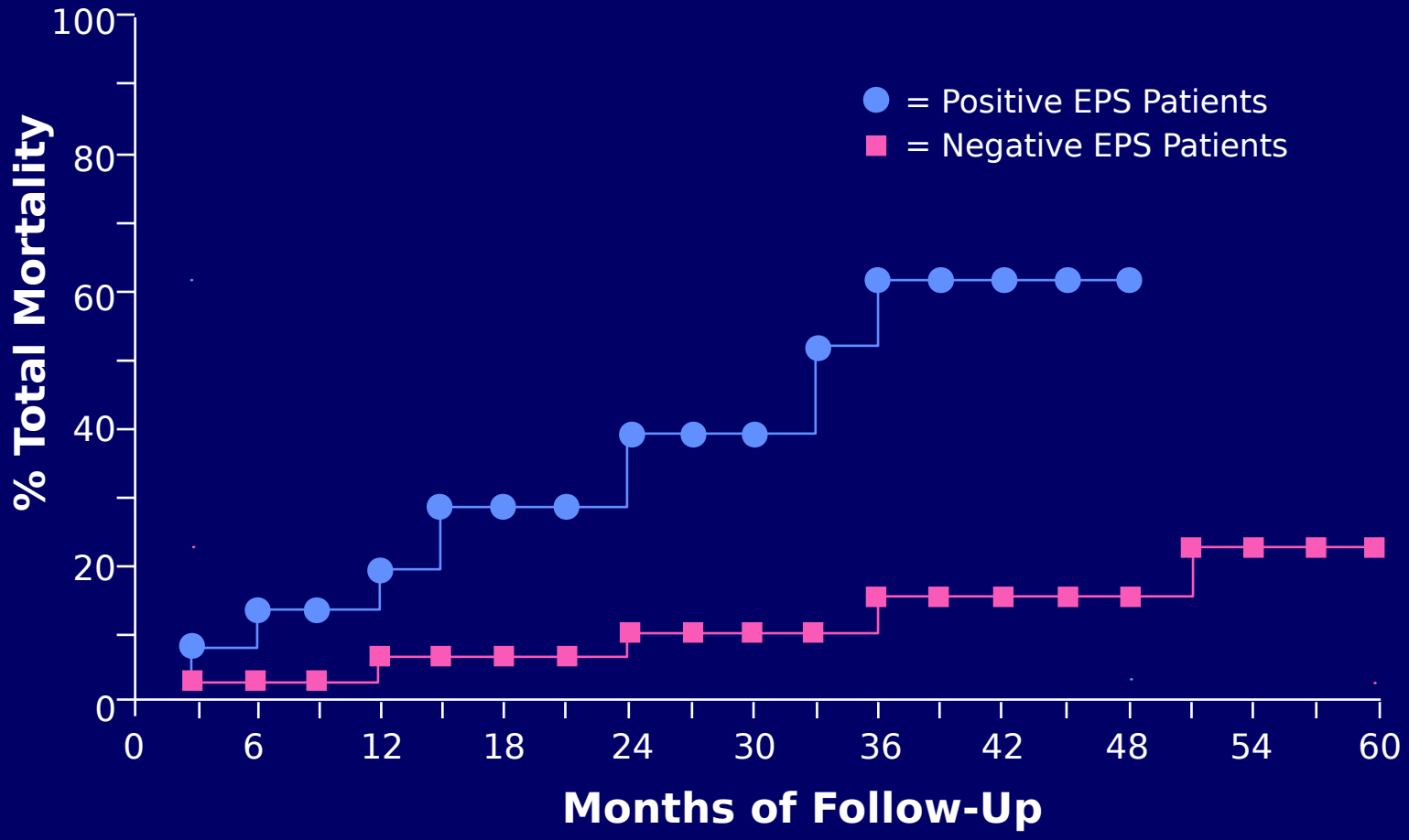
Sra JS. Ann Intern Med. 1991;114:1013-1019.

Frequency (%) of Various Causes of Syncope

Author (N)	Vasovagal Unknown	Neurologic	Cardiac *Nonarrhythmic*	*Bradycardia*	*Tachycardia*	Other
Eagle (100)	31	6	8	5	7	4	39
Day (198)	40	32	3	2.5	2.5	7	13
Silverstein (108)	4.5	4.5	9	9	18	8	47
Kapoor (204) (1983)	19	3	6	9	11	4	48
Martin (170)	45	9	0.5	0.5	3	4	38
Kapoor (433) (1990)	26	4	6	7	13	3	41

Chang-Sing P. Cardiol Clinics. 1991;9(4):641-651.

Risk of Mortality from Syncope Based on Outcome of EP Study



Bass EB. Am J Cardiol. 1988;62:1186-1191.

Risk of Mortality from Various Causes of Syncope

Author (N)	Mean Follow-Up Period (Months)	Mortality at Follow-up (%)		
		Cardiac Cause of Syncope	*Noncardiac Cause of Syncope*	*Unknown*
Day (198)	12	33		
Silverstein (108)	12	19	6	6
Kapoor (204) (1983)	12	30	12	6
Martin (170)	6	30	1	1.5
Kapoor (433) (1990)	12	26	8	6
	60	50	31	24

Chang-Sing P. Cardiol Clinics. 1991;9(4):641-651.

Risk of Mortality from Various Causes of Syncope

Mortality risk much higher (mean 30%) if syncope is due to cardiac cause.

Tilt Table Test for Syncope

- Used to test for neurally-mediated syncope
- Measure heart rate and blood pressure in supine & 70° head-up tilt positions
- Isoproterenol infusion often added

Tilt Table Test for Syncope

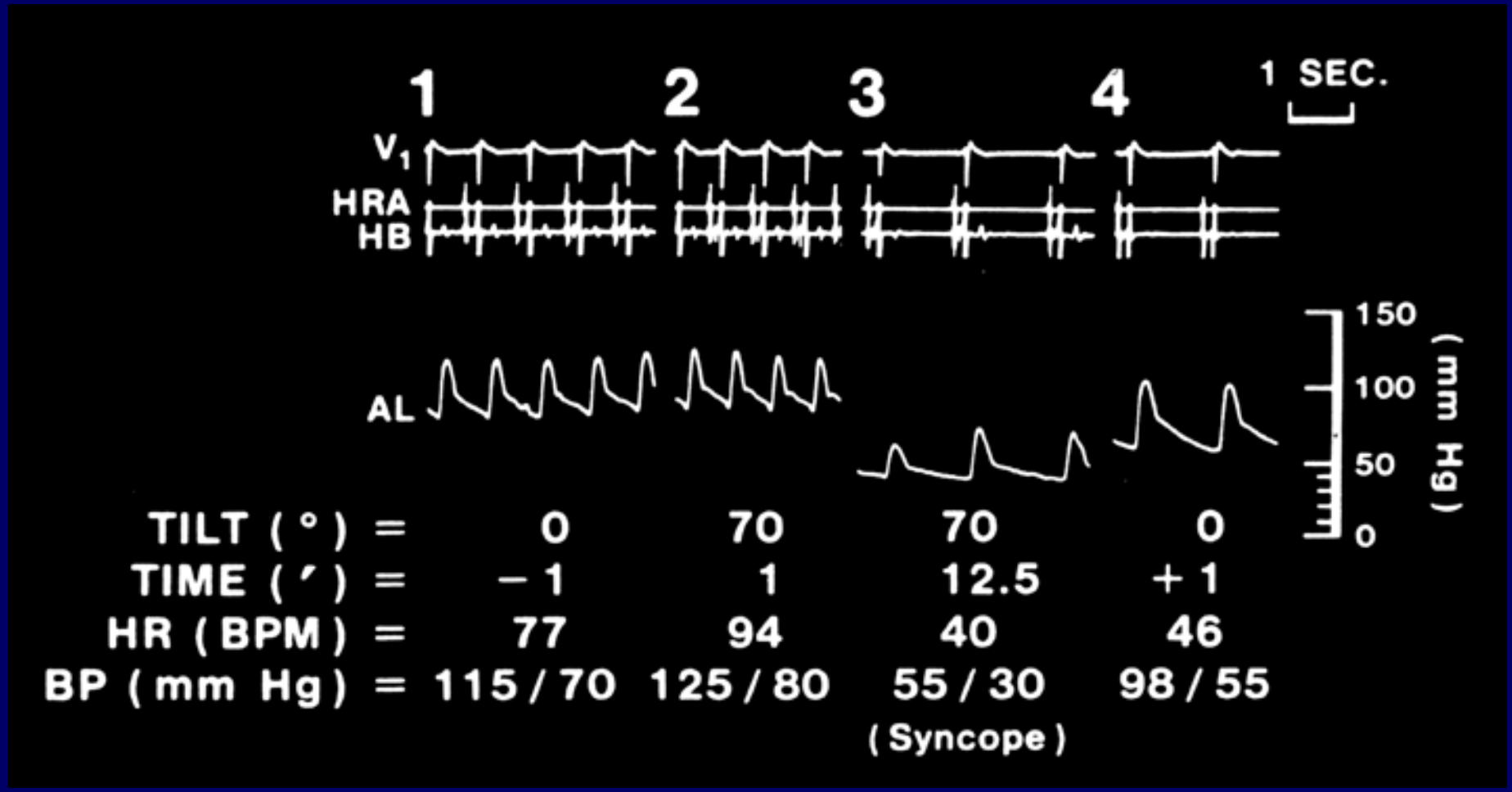
Abnormal responses seen during positive tilt test:

- **Hypotension**
- **Bradycardia (sinus, junctional, or AV nodal block)**
- **Asystole**

Classification of Abnormal Responses to Tilt Table Testing

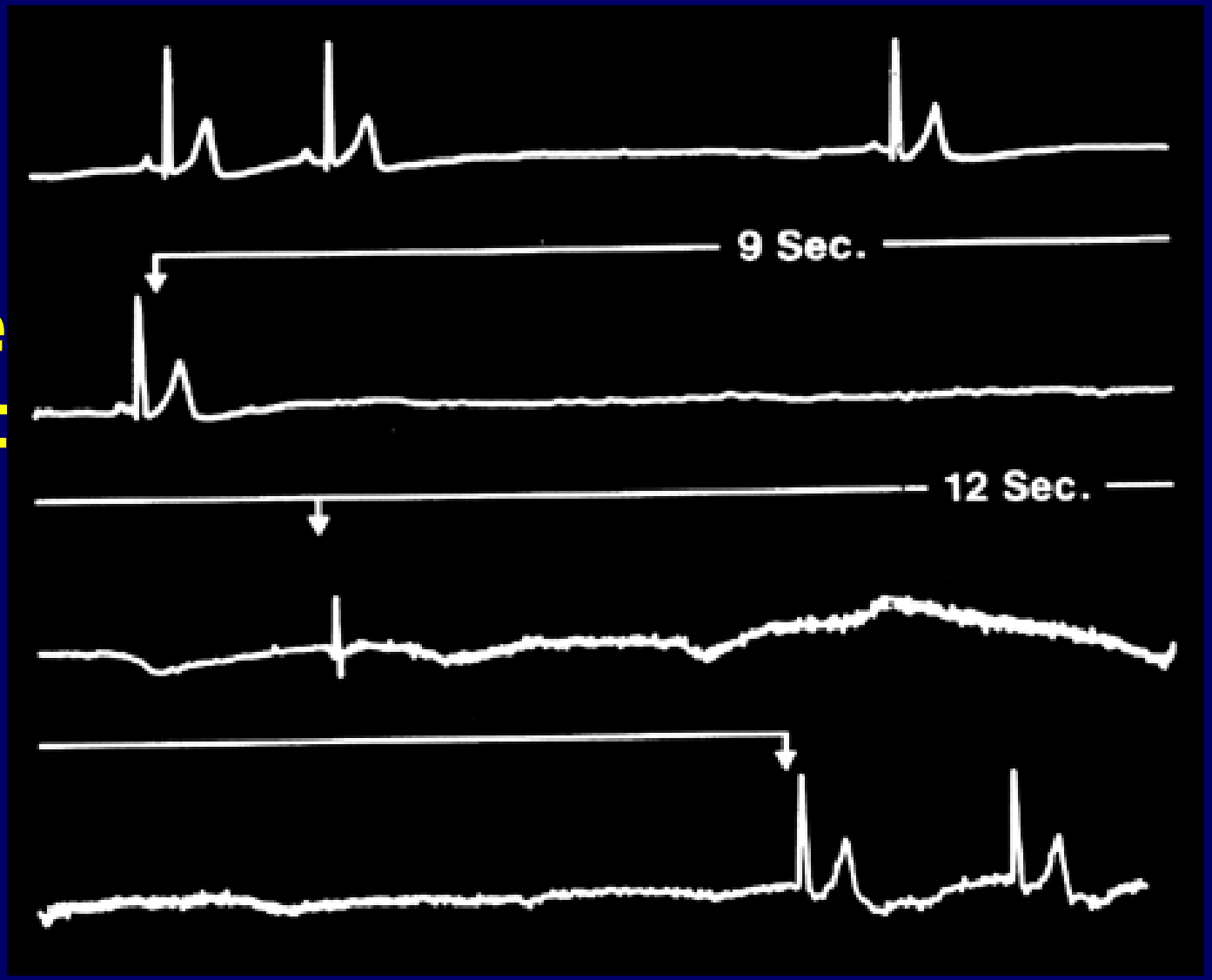
- Cardio-inhibitory (mainly bradycardia)
- Vasodepressor (marked hypotension without marked bradycardia)
- Mixed (hypotension with bradycardia)

Tilt Table Response in Patient with Neurally-Mediated Syncope



Sra JS. Ann Intern Med. 1991;114:1013-1019.

Tilt Table Response in Patient with Neurally-Mediated Syncope



Sra JS. Ann Intern Med. 1991;114:1013-1019.

Mechanism of Tilt Table Response

Physiology of head-up tilt

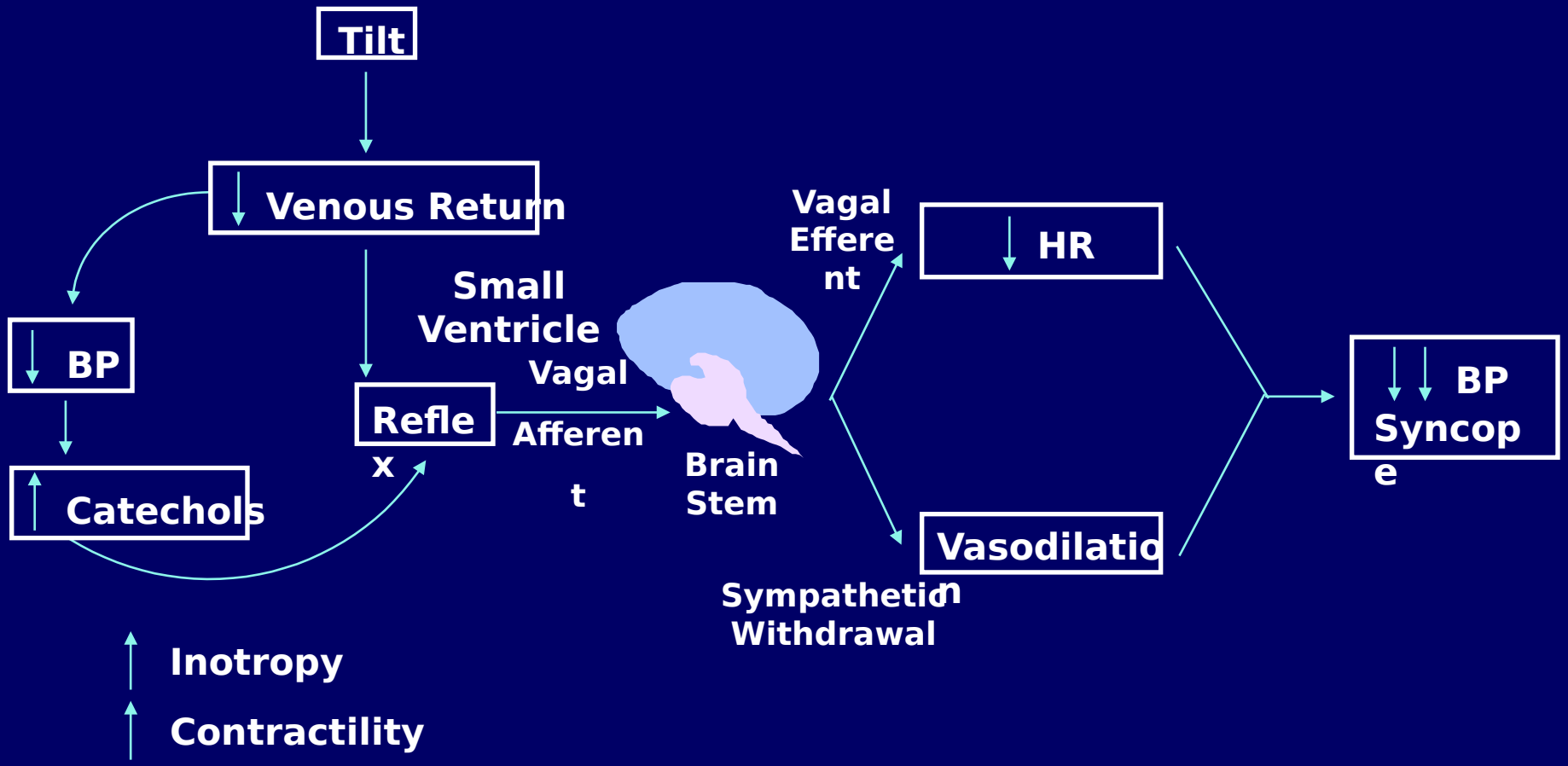
- Displaces blood from intrathoracic vascular compartment to more dependent vascular structures
- Results in drop in CVP, cardiac stroke volume, and systemic arterial pressure
- Normally activates cardiovascular and cardiopulmonary reflexes resulting in vasoconstriction and increased chronotropy and inotropy to restore systemic arterial pressure

Mechanism of Abnormal Tilt Table Response

- In patients at risk for neurally-mediated syncope, abnormal response develops, resulting in hypotension and/or bradycardia and reproduction of syncope or near-syncope.

- Bezold-Jarisch reflex is thought to mediate this abnormal response through increased parasympathetic or vagal efferent activity.

Bezold-Jarisch Reflex



Chang-Sing P. Cardiol Clinics. 1991;9(4):641-651.

Therapy for Neurally-Mediated Syncope

Therapy is directed at various arms of reflex:

Afferent arm:

- **Beta blockers**
- **Anticholinergics**
- **Negative inotropic agents**

Intravascular volume:

- **Expanders such as florinef (mineral-corticoid)**

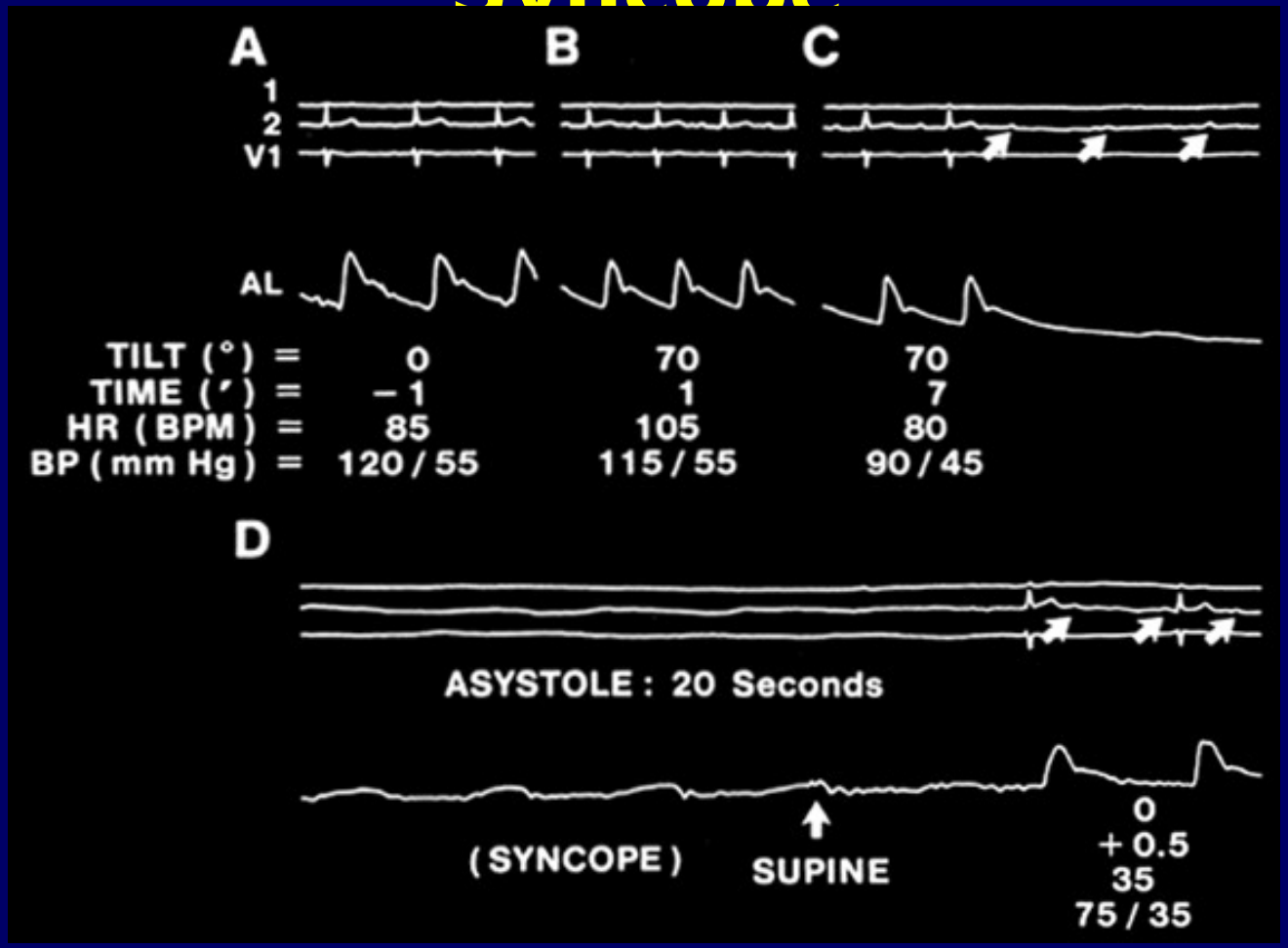
Efferent arm:

- **Antivagal drugs such as scopolamine or α-agonists**

Therapy for Neurally-Mediated Syncope

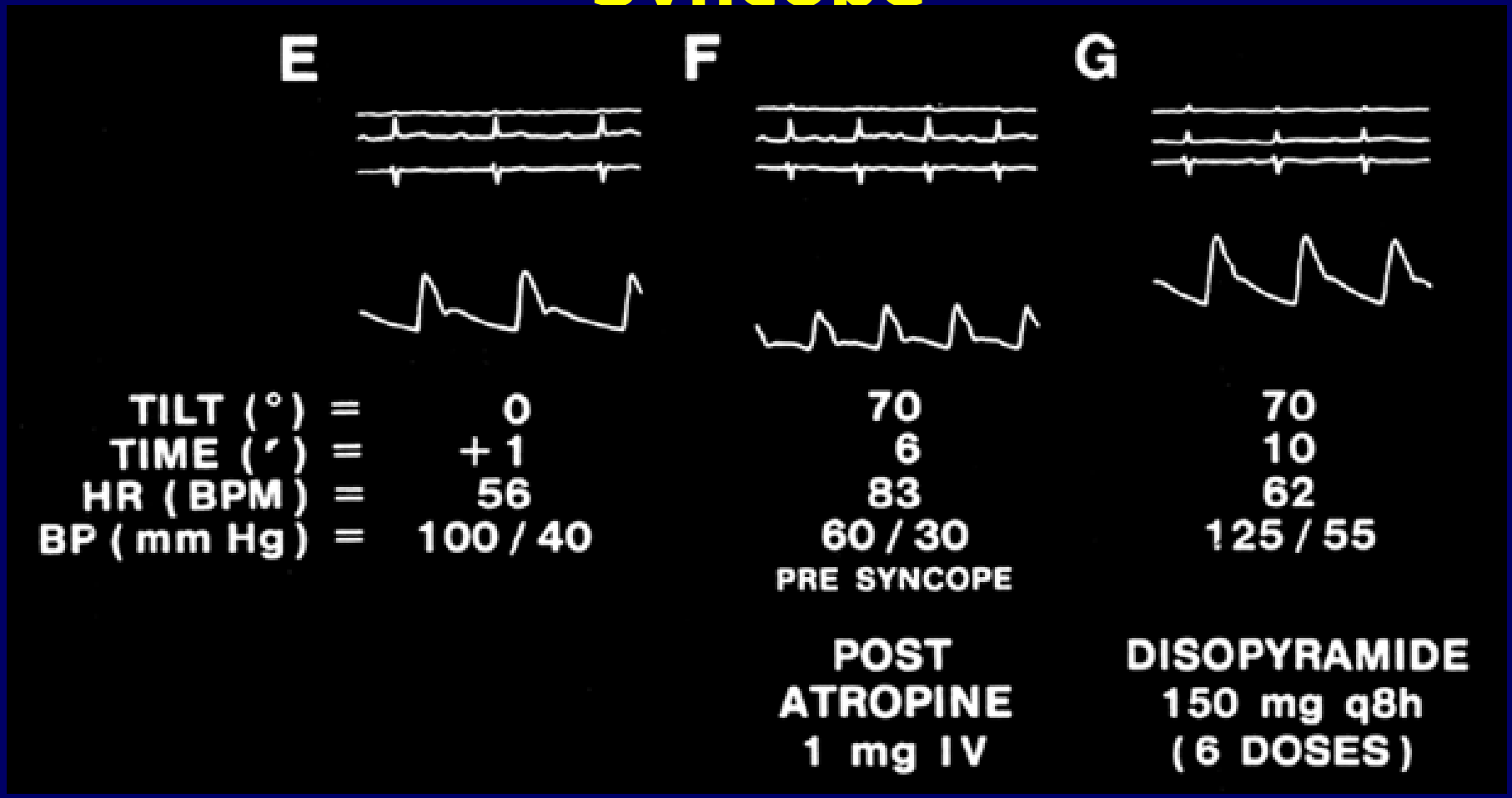
- Beta blockers (metoprolol, atenolol, pindolol)
- Disopyramide (anticholinergic, negative inotropic, & α-adrenergic)
- Florinef
- Midodrine (new α-agonist)
- Permanent pacing

Tilt Table Testing in Patient Treated with Disopyramide for Neurally-Mediated Syncope



Sra JS. Ann Intern Med. 1991;114:1013-1019.

Tilt Table Testing in Patient Treated with Disopyramide for Neurally-Mediated Syncope



Sra JS. Ann Intern Med. 1991;114:1013-1019.

Experience with Insertable Loop Recorder for Recurrent Unexplained Syncope

- **Patient profile**
  - **Recurrent unexplained syncope**
  - **Negative tilt table & EP study**

Krahn AD, Klein GJ, et al. Circulation. 1995;92:1819-1824.

Patient Screening for Insertable Loop Recorder for Syncope

209 patients with syncope

H & P, ECG, tilt table test → Presumptive diagnosis 146 patients

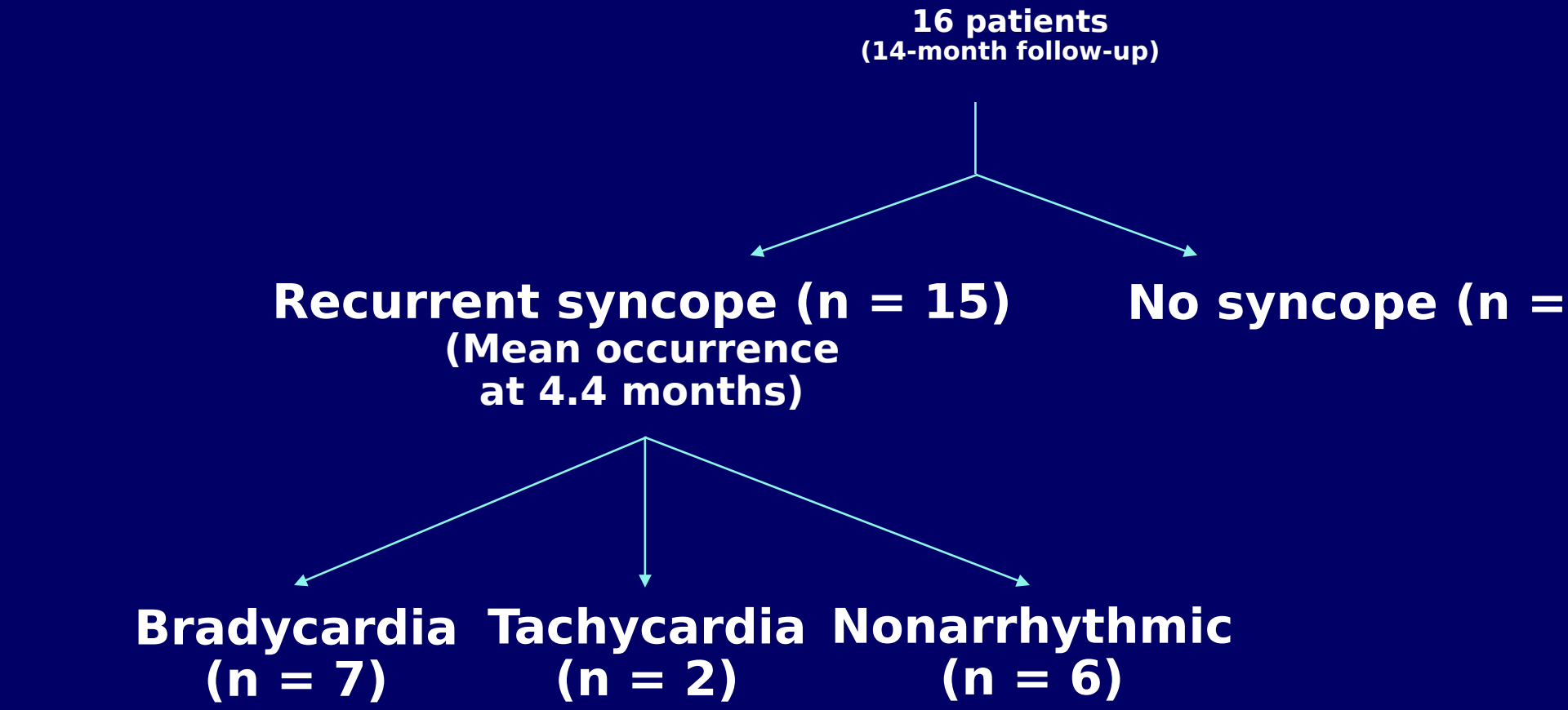
63 patients with no diagnosis

41 patients underwent EP study

Of negative EP patients, 16 had “syncope monitor” implanted

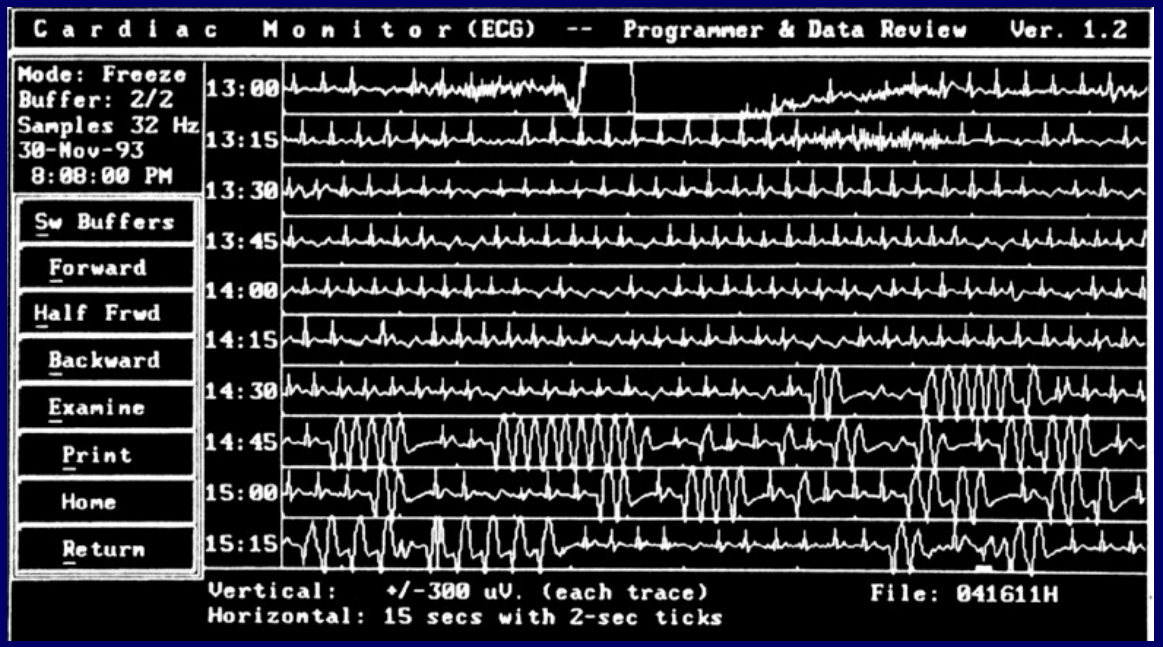
Krahn AD, Klein GJ, et al. Circulation. 1995;92:1819-1824.

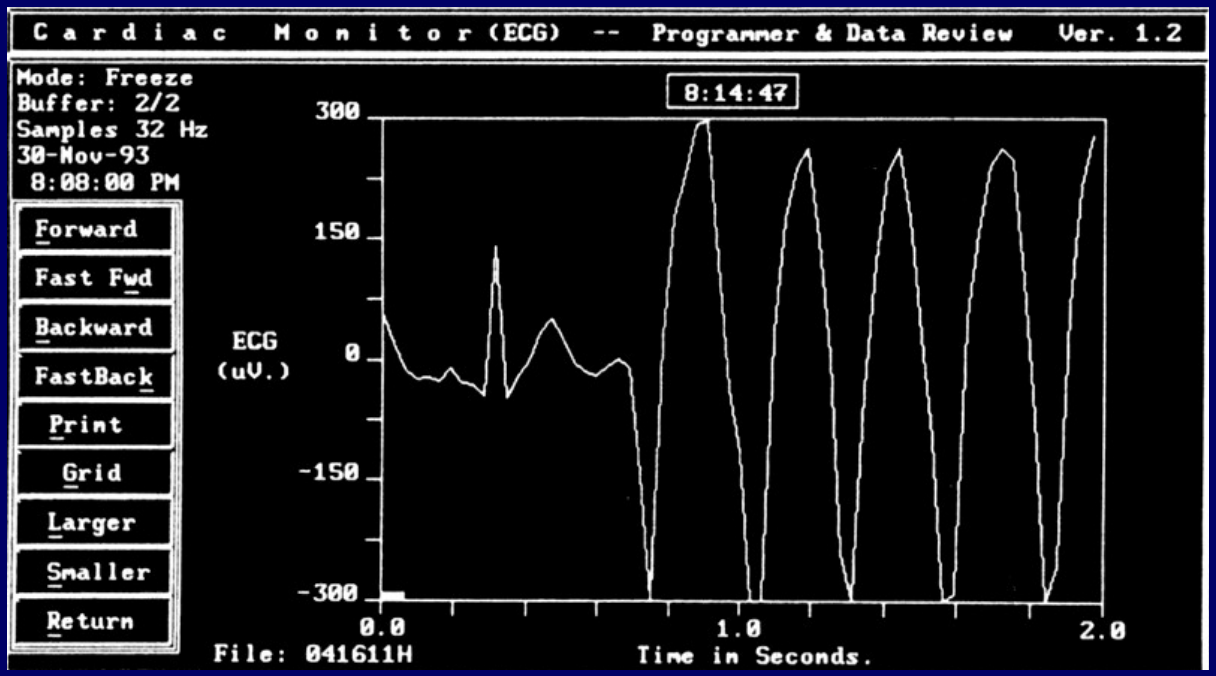
Findings with Insertable Loop Recorder



Krahn AD, Klein GJ, et al. Circulation. 1995;92:1819-1824.

Syncope Monitor Recording

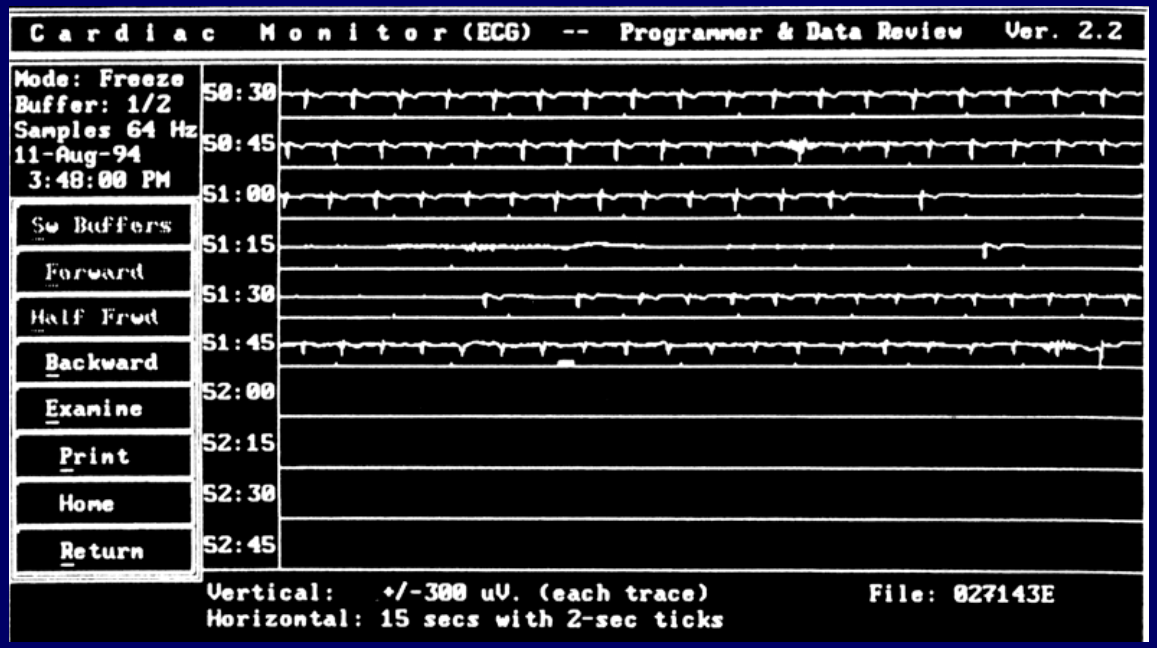


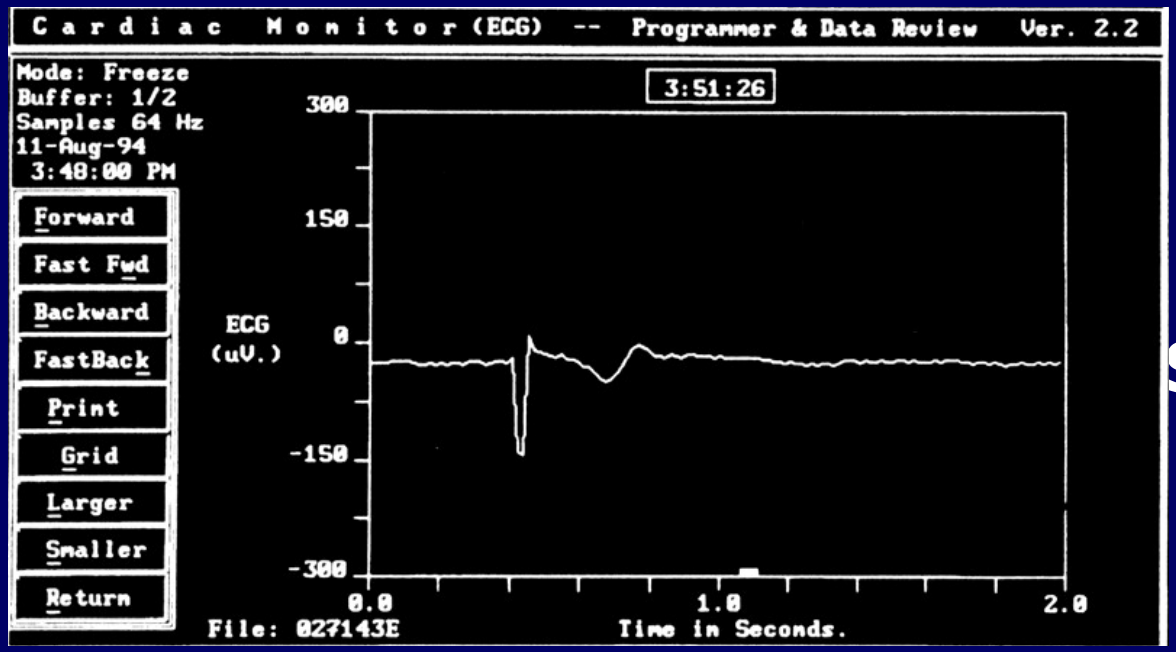


Nonsustained VT

Krahn AD, Klein GJ, et al. Circulation. 1995;92:1819-1824.

Syncope Monitor Recording

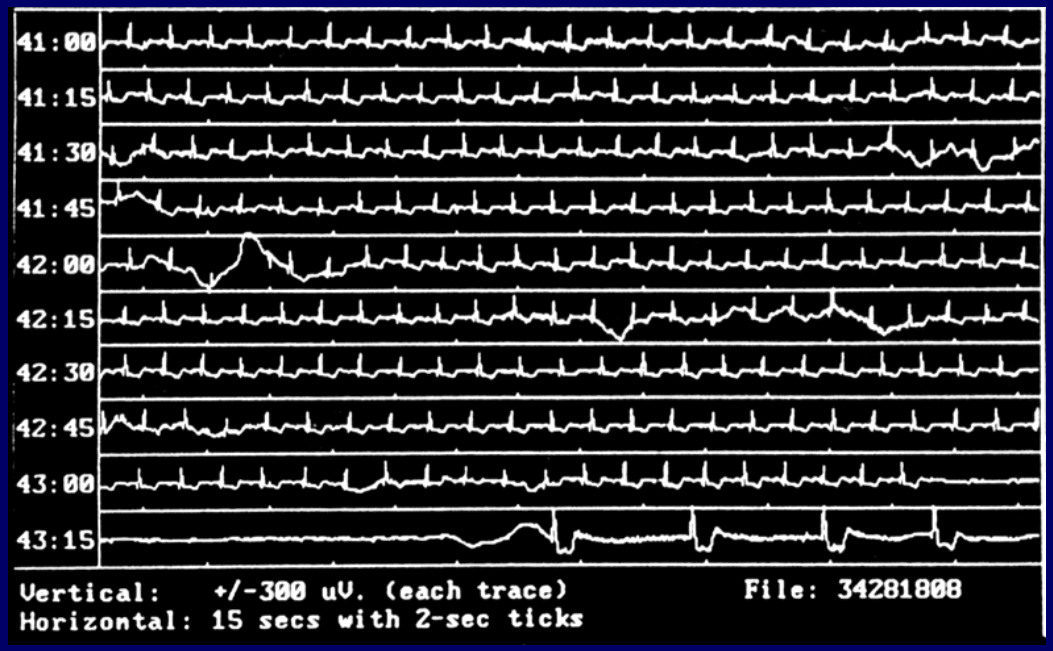


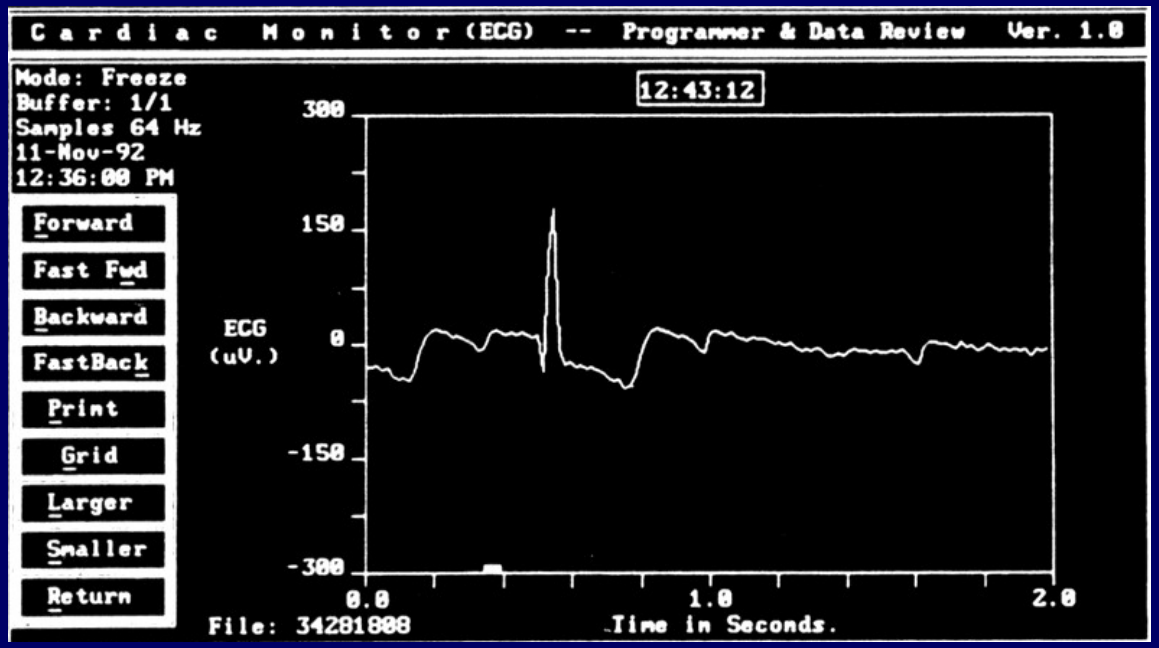


Sinus Arrest

Krahn AD, Klein GJ, et al. Circulation. 1995;92:1819-1824.

Syncope Monitor Recording

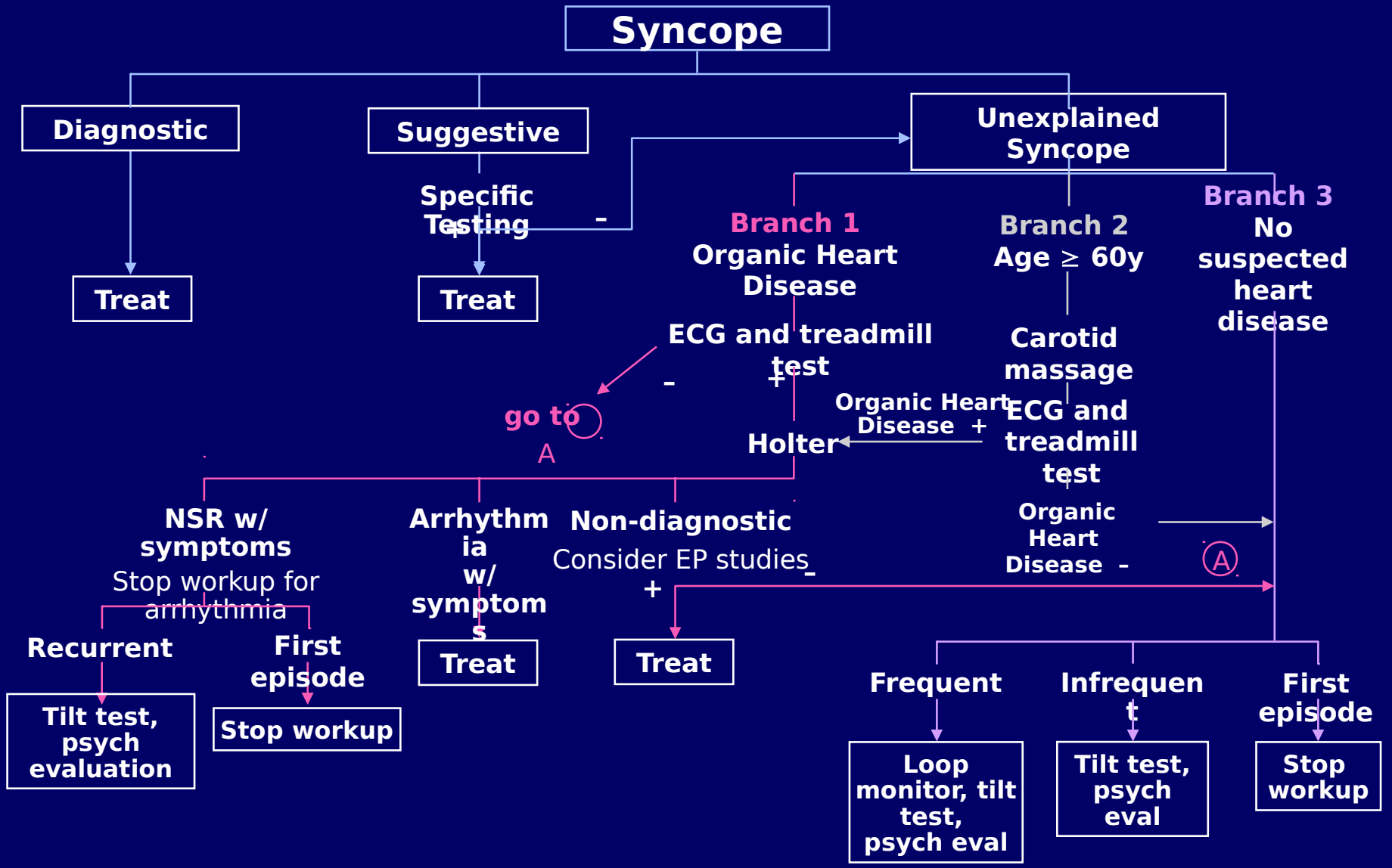




AV Block

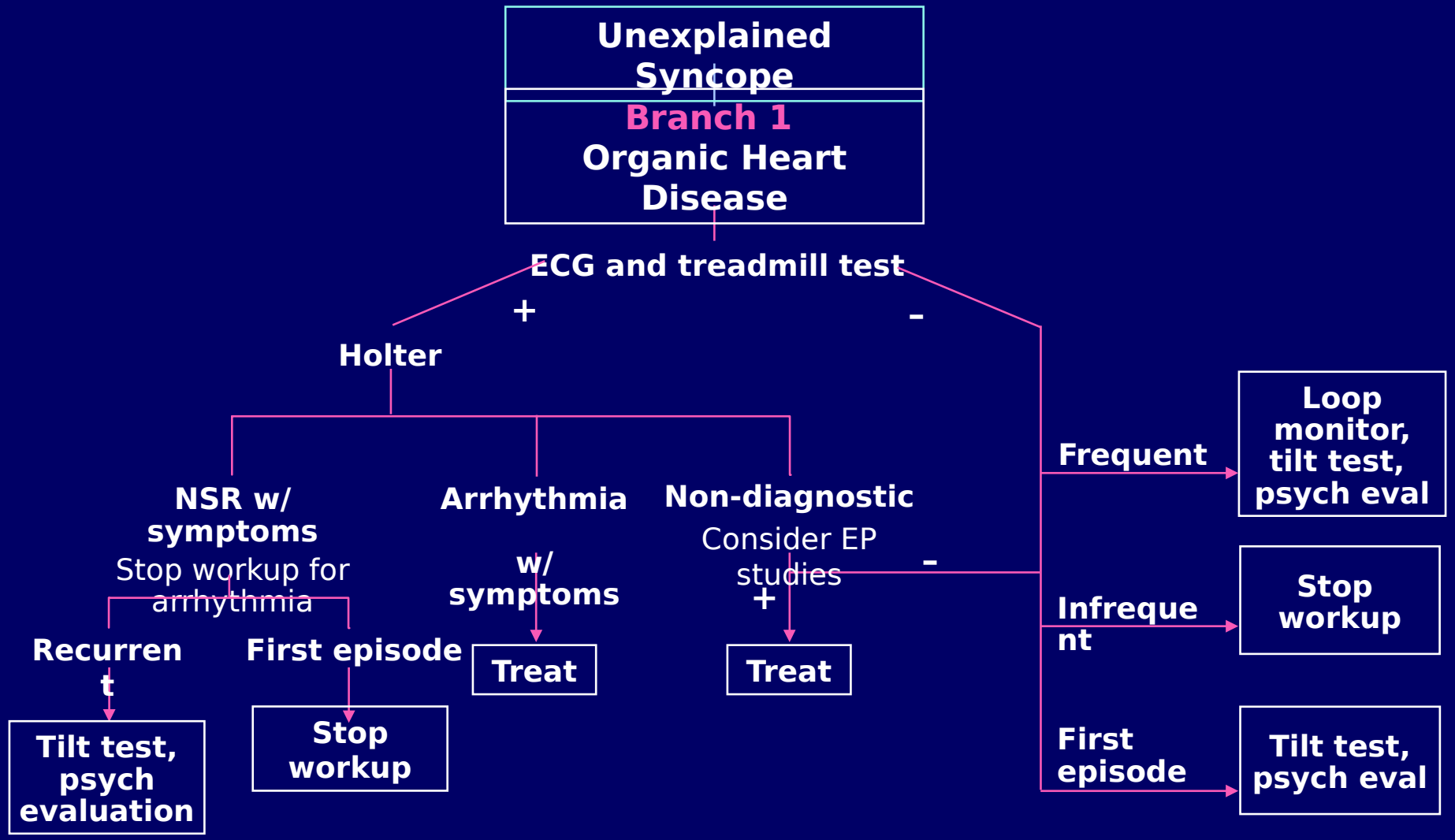
Krahn AD, Klein GJ, et al. Circulation. 1995;92:1819-1824.

Algorithm for Diagnosing Syncope



Linzer M, Yang EH, Estes M, et al. Ann Intern Med. 1997;127:76-86

Algorithm for Diagnosing Syncope



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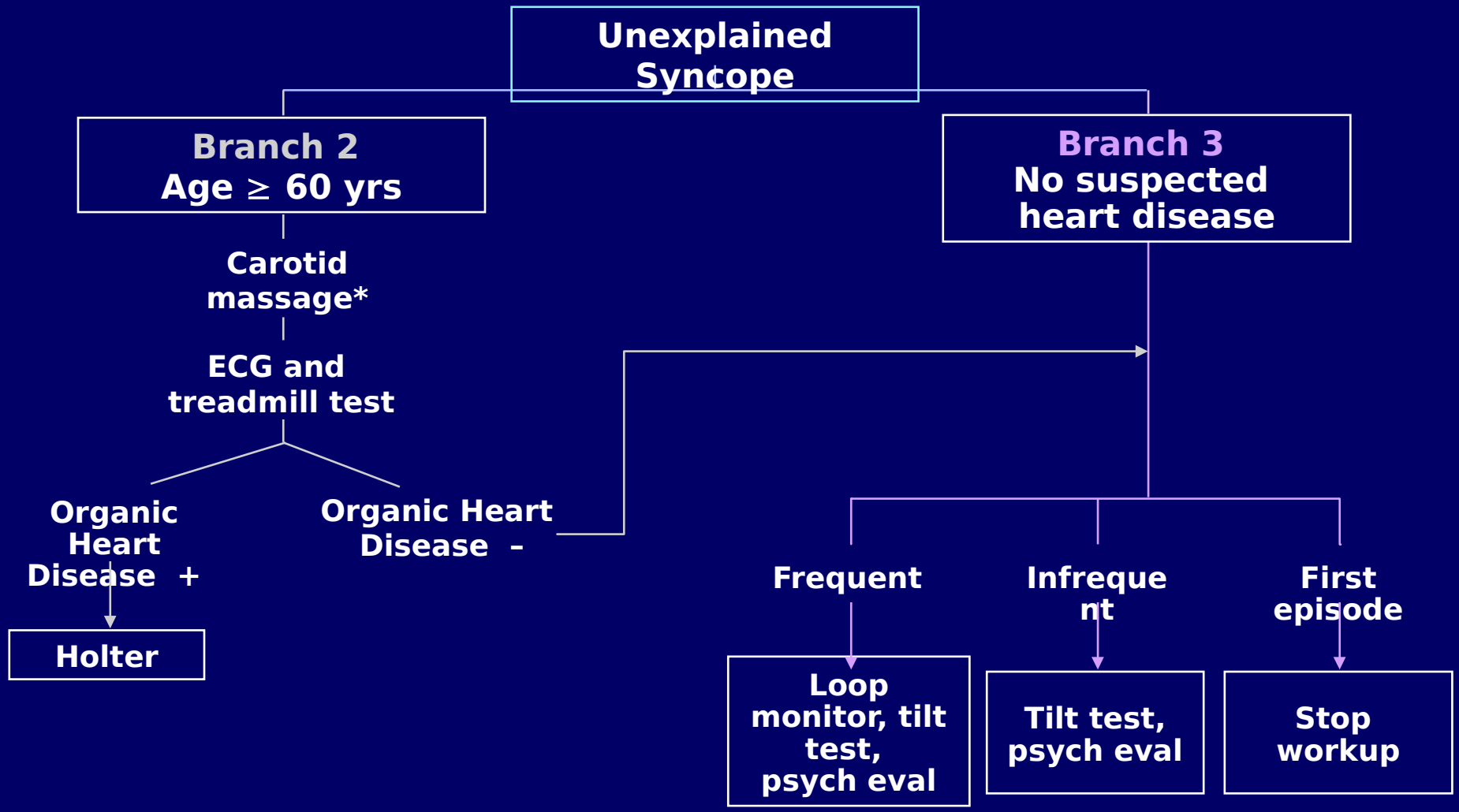
Algorithm for Diagnosing Syncope



* Performed in office setting only in the absence of bruits, a history of ventricular tachycardia, recent stroke, or recent myocardial infarction.

Linzer M, Yang EH, Estes M, et al. Ann Intern Med. 1997;127:76-86

Role of Permanent Pacing in Syncope Management

ndications for permanent pacing:

- Sinus node dysfunction
  (documented symptomatic bradycardia)
- Carotid sinus hypersensitivity
  > 3 sec. of asystole or recurrent syncope with hypersensitive cardio-inhibitory response
- Bifascicular block with intermittent complete heart bloc
- Bifascicular or trifascicular block with intermittent type II
  2nd degree AV block

Adapted from ACC/AHA Task Force Report. J Am Coll Cardiol. 1991;18(1):1-13.

Role of Permanent Pacing in Syncope Management

Indications for permanent pacing:

- Bifascicular or trifascicular block with syncope without other identifiable causes of syncope
- Markedly prolonged HV interval (> 100 msec.) in asymptomatic patients
- Prolonged HV interval (> 80 msec.) with syncope without other identifiable causes of syncope
- Demonstrable infra-Hisian or intra-Hisian block
- Neurally-mediated syncope where pacing is effective

Adapted from ACC/AHA Task Force Report. J Am Coll Cardiol. 1991;18(1):1-3.